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SEQUENCE LISTING

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Roberts, Nicholas J.
The Regents of the University of California

<120> LNP, a Protein Involved in the Initiation of
Mycorrhizal Infection in Plants

<130> 023070-079820US

<140> US 09/657,631
<141> 2000-09-06

<160> 14

<170> PatentIn Ver. 2.1

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DB46) root lectin

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-45 -40 -35

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Phe Leu Leu Phe Ser Leu Pro Lys Leu Ser Ser Gln Tyr Val Gly
-30 -25 -20 -15

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Asn Ser Ile Leu Leu Asn His Arg Lys Ile Leu Pro Asn Gln Glu Leu
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Leu Thr Ser Tyr Ala Val Ile Phe Asp Ala Gly Ser Ser Gly Ser Arg
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gtc cat gtc ttc aat ttt gac cag aac tta gat ctc ctg cac att ggc 296
Val His Val Phe Asn Phe Asp Gln Asn Leu Asp Leu Leu His Ile Gly
20 25 30

aat gac ctc gag ttt aca aaa aag atc aaa ccc ggt ttg agc tca tac 344
Asn Asp Leu Glu Phe Thr Lys Lys Ile Lys Pro Gly Leu Ser Ser Tyr
35 40 45 50

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gaa gct gaa gat gtt gtc cct gag gaa ctg cac ccc aag aca ccc ctt Glu Ala Glu Asp Val Val Pro Glu Glu Leu His Pro Lys Thr Pro Leu	70	75	80	440
aag ctt ggg gca aca gca ggt ttg agg ctc ttg gat ggg gat gct gct Lys Leu Gly Ala Thr Ala Gly Leu Arg Leu Leu Asp Gly Asp Ala Ala	85	90	95	488
gaa aag ata ttg caa gcg gtt agg gaa atg ttc agg aac aga agt tcc Glu Lys Ile Leu Gln Ala Val Arg Glu Met Phe Arg Asn Arg Ser Ser	100	105	110	536
ctg agc gtt caa cct gat gca gta tct gtt att gat gga acc caa gaa Leu Ser Val Gln Pro Asp Ala Val Ser Val Ile Asp Gly Thr Gln Glu	115	120	125	584
ggt tct tac tta tgg gtt aca gtt aac tat ctg tta gga aag ttg gga Gly Ser Tyr Leu Trp Val Thr Val Asn Tyr Leu Leu Gly Lys Leu Gly	135	140	145	632
aag aag ttt aca aaa act gtg gga gtg ata gat ctt gga ggt gct tca Lys Lys Phe Thr Lys Thr Val Gly Val Ile Asp Leu Gly Gly Ala Ser	150	155	160	680
gtt caa atg gct tat gct gtc tca aga aat aca gct aaa aat gcc cca Val Gln Met Ala Tyr Ala Val Ser Arg Asn Thr Ala Lys Asn Ala Pro	165	170	175	728
aaa cca cca caa gga gag gat cca tac atg aag aag ctt gta ctc aag Lys Pro Pro Gln Gly Glu Asp Pro Tyr Met Lys Lys Leu Val Leu Lys	180	185	190	776
gga aag aaa tat gac ctt tat gtt cac agt tac ttg cgt tat ggt aac Gly Lys Lys Tyr Asp Leu Tyr Val His Ser Tyr Leu Arg Tyr Gly Asn	195	200	205	824
gac gca gca cgt gtt aag att ttt aag acc act gat ggt gct gct agt Asp Ala Ala Arg Val Lys Ile Phe Lys Thr Thr Asp Gly Ala Ala Ser	215	220	225	872
cct tgt cta ttg gca ggc tat gaa gat ata tac aga tat tcc gga gaa Pro Cys Leu Leu Ala Gly Tyr Glu Asp Ile Tyr Arg Tyr Ser Gly Glu	230	235	240	920
tgc tac aat atc tat ggt ccc act tct ggt gcc aac ttt aat gag tgc Ser Tyr Asn Ile Tyr Gly Pro Thr Ser Gly Ala Asn Phe Asn Glu Cys	245	250	255	968
cgt gac cta gct ctt cag att ctc aga ttg aat gag cca tgt tcc cat Arg Asp Leu Ala Leu Gln Ile Leu Arg Leu Asn Glu Pro Cys Ser His	260	265	270	1016
gaa aac tgc acc ttt ggt ggg ata tgg gat ggt gga aaa gga agt gga Glu Asn Cys Thr Phe Gly Gly Ile Trp Asp Gly Gly Lys Gly Ser Gly	275	280	285	1064
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Gln Lys Asn Leu Val Val Thr Ser Ala Phe Tyr Tyr Arg Ser Ser Glu			
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gtt ggt ttt gtc act cct ccc aat tcc aaa aat cgc cct ctg gat ttt		1160	
Val Gly Phe Val Thr Pro Pro Asn Ser Lys Asn Arg Pro Leu Asp Phe			
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gaa act gca gct aaa caa gct tgt agt tta aca ttc gag gaa gcg aaa		1208	
Glu Thr Ala Ala Lys Gln Ala Cys Ser Leu Thr Phe Glu Glu Ala Lys			
325	330	335	
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Ser Thr Phe Pro Asn Val Glu Lys Asp Lys Leu Pro Phe Val Cys Val			
340	345	350	
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Asp Phe Thr Tyr Gln Tyr Thr Leu Leu Val Asp Gly Phe Gly Leu Asp			
355	360	365	370
cca gag caa gag att aca gtg gca gaa gga att gaa tat caa gat gcc		1352	
Pro Glu Gln Glu Ile Thr Val Ala Glu Gly Ile Glu Tyr Gln Asp Ala			
375	380	385	
att gtg gaa aca gca tgg cct cta gga act gcc ata gaa gcc ata tca		1400	
Ile Val Glu Thr Ala Trp Pro Leu Gly Thr Ala Ile Glu Ala Ile Ser			
390	395	400	
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Ser Leu Pro Lys Phe Asn Arg Leu Met Tyr Phe Ile			
405	410	415	
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<213> Dolichos biflorus

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Val Gly Asn Ser Ile Leu Leu Asn His Arg Lys Ile Leu Pro Asn Gln
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Glu Leu Leu Thr Ser Tyr Ala Val Ile Phe Asp Ala Gly Ser Ser Gly
50 55 60
Ser Arg Val His Val Phe Asn Phe Asp Gln Asn Leu Asp Leu Leu His
65 70 75 80

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				85				90						95	
Ser	Tyr	Ala	Asp	Lys	Pro	Glu	Lys	Ala	Ala	Glu	Ser	Leu	Ile	Pro	Leu
				100				105					110		
Leu	Glu	Glu	Ala	Glu	Asp	Val	Val	Pro	Glu	Glu	Leu	His	Pro	Lys	Thr
				115				120				125			
Pro	Leu	Lys	Leu	Gly	Ala	Thr	Ala	Gly	Leu	Arg	Leu	Leu	Asp	Gly	Asp
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Ala	Ala	Glu	Lys	Ile	Leu	Gln	Ala	Val	Arg	Glu	Met	Phe	Arg	Asn	Arg
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Ser	Ser	Leu	Ser	Val	Gln	Pro	Asp	Ala	Val	Ser	Val	Ile	Asp	Gly	Thr
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Gln	Glu	Gly	Ser	Tyr	Leu	Trp	Val	Thr	Val	Asn	Tyr	Leu	Gly	Lys	
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Leu	Gly	Lys	Phe	Thr	Lys	Thr	Val	Gly	Val	Ile	Asp	Leu	Gly	Gly	
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Ala	Ser	Val	Gln	Met	Ala	Tyr	Ala	Val	Ser	Arg	Asn	Thr	Ala	Lys	Asn
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				260				265				270			
Ala	Ser	Pro	Cys	Leu	Leu	Ala	Gly	Tyr	Glu	Asp	Ile	Tyr	Arg	Tyr	Ser
				275				280				285			
Gly	Glu	Ser	Tyr	Asn	Ile	Tyr	Gly	Pro	Thr	Ser	Gly	Ala	Asn	Phe	Asn
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Glu	Cys	Arg	Asp	Leu	Ala	Leu	Gln	Ile	Leu	Arg	Leu	Asn	Glu	Pro	Cys
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Ser	His	Glu	Asn	Cys	Thr	Phe	Gly	Gly	Ile	Trp	Asp	Gly	Gly	Lys	Gly
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Ser	Glu	Val	Gly	Phe	Val	Thr	Pro	Pro	Asn	Ser	Lys	Asn	Arg	Pro	Leu
				355				360				365			
Asp	Phe	Glu	Thr	Ala	Ala	Lys	Gln	Ala	Cys	Ser	Leu	Thr	Phe	Glu	Glu
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Ala	Lys	Ser	Thr	Phe	Pro	Asn	Val	Glu	Lys	Asp	Lys	Leu	Pro	Phe	Val
				385				390			395			400	
Cys	Val	Asp	Phe	Thr	Tyr	Gln	Tyr	Thr	Leu	Leu	Val	Asp	Gly	Phe	Gly
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Leu	Asp	Pro	Glu	Gln	Glu	Ile	Thr	Val	Ala	Glu	Gly	Ile	Glu	Tyr	Gln
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Asp	Ala	Ile	Val	Glu	Thr	Ala	Trp	Pro	Leu	Gly	Thr	Ala	Ile	Glu	Ala
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 root lectin

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ctc ttg tta atg cct gca atc act tcc tcc caa tat tta gga aac aac      96
Leu Leu Leu Met Pro Ala Ile Thr Ser Ser Gln Tyr Leu Gly Asn Asn
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cta ctc act aat cga aag att ttc caa aaa caa gaa acc tta acc tct      144
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   35          40          45

tac gct gtc ata ttt gat gct ggt agc act ggt act cgt gtc cat gtt      192
Tyr Ala Val Ile Phe Asp Ala Gly Ser Thr Gly Thr Arg Val His Val
   50          55          60

tac cat ttt gat cag aac tta gat cta ctt cac att ggc aat gat att      240
Tyr His Phe Asp Gln Asn Leu Asp Leu Leu His Ile Gly Asn Asp Ile
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gag ttt gtt gac aag atc aaa cca ggt ttg agt gca tat ggg gat aat      288
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cct gaa caa gca gca aaa tct ctc att cca ctt ttg gag gaa gca gaa      336
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gat gtg gtt cct gag gat ctg cac ccc aaa aca ccc ctt agg ctt ggg      384
Asp Val Val Pro Glu Asp Leu His Pro Lys Thr Pro Leu Arg Leu Gly
   115         120         125

gca acc gca ggt ttg agg ctt ttg aat ggg gat gct gct gaa aag ata      432
Ala Thr Ala Gly Leu Arg Leu Leu Asn Gly Asp Ala Ala Glu Lys Ile
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ttg caa gcg aca agg aat atg ttc agc aac aga agt acc ctc aac gtt      480
Leu Gln Ala Thr Arg Asn Met Phe Ser Asn Arg Ser Thr Leu Asn Val
   145         150         155         160

caa cgt gat gca gtt tct att att gat gga acc caa gaa ggt tct tat      528
Gln Arg Asp Ala Val Ser Ile Ile Asp Gly Thr Gln Glu Gly Ser Tyr
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atg tgg gtg aca gtt aac tat gta ttg ggg aat ttg gga aaa agc ttc      576
Met Trp Val Thr Val Asn Tyr Val Leu Gly Asn Leu Gly Lys Ser Phe
   180         185         190

aca aaa tca gtg gga gta att gac ctt gga ggt ggt tca gtt caa atg      624
Thr Lys Ser Val Gly Val Ile Asp Leu Gly Gly Ser Val Gln Met
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225	230	235	240
tat gat ctc tat gtt cat agt tac ttg cgt ttt ggc aaa gaa gca act	768		
Tyr Asp Leu Tyr Val His Ser Tyr Leu Arg Phe Gly Lys Glu Ala Thr			
245	250	255	
cga gca cag gtt ttg aat gca act aat gga tct gct aac cct tgc att	816		
Arg Ala Gln Val Leu Asn Ala Thr Asn Gly Ser Ala Asn Pro Cys Ile			
260	265	270	
tta cct gga ttt aat ggg acc ttt aca tat tca gga gtg gag tat aag	864		
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275	280	285	
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Ala Phe Ser Pro Ser Ser Gly Ser Asn Phe Asp Asp Cys Lys Glu Ile			
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Thr Phe Gly Gly Ile Trp Asn Gly Gly Ser Gly Gln Lys Lys			
325	330	335	
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340	345	350	
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355	360	365	
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Thr Tyr Pro Arg Leu Thr Asp Ala Lys Arg Pro Tyr Val Cys Met Asp			
385	390	395	400
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435	440	445	

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gtc aag ata ttt cag taa cag cta act tta tca aaa att aaa taa aac 1440
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root lectin

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Leu Leu Thr Asn Arg Lys Ile Phe Gln Lys Gln Glu Thr Leu Thr Ser
35 40 45
Tyr Ala Val Ile Phe Asp Ala Gly Ser Thr Gly Thr Arg Val His Val
50 55 60
Tyr His Phe Asp Gln Asn Leu Asp Leu Leu His Ile Gly Asn Asp Ile
65 70 75 80
Glu Phe Val Asp Lys Ile Lys Pro Gly Leu Ser Ala Tyr Gly Asp Asn
85 90 95
Pro Glu Gln Ala Ala Lys Ser Leu Ile Pro Leu Leu Glu Ala Glu
100 105 110
Asp Val Val Pro Glu Asp Leu His Pro Lys Thr Pro Leu Arg Leu Gly
115 120 125
Ala Thr Ala Gly Leu Arg Leu Leu Asn Gly Asp Ala Ala Glu Lys Ile
130 135 140
Leu Gln Ala Thr Arg Asn Met Phe Ser Asn Arg Ser Thr Leu Asn Val
145 150 155 160
Gln Arg Asp Ala Val Ser Ile Ile Asp Gly Thr Gln Glu Gly Ser Tyr
165 170 175
Met Trp Val Thr Val Asn Tyr Val Leu Gly Asn Leu Gly Lys Ser Phe
180 185 190
Thr Lys Ser Val Gly Val Ile Asp Leu Gly Gly Ser Val Gln Met
195 200 205
Thr Tyr Ala Val Ser Lys Lys Thr Ala Lys Asn Ala Pro Lys Val Ala
210 215 220
Asp Gly Glu Asp Pro Tyr Ile Lys Lys Leu Val Leu Lys Gly Lys Gln
225 230 235 240
Tyr Asp Leu Tyr Val His Ser Tyr Leu Arg Phe Gly Lys Glu Ala Thr
245 250 255
Arg Ala Gln Val Leu Asn Ala Thr Asn Gly Ser Ala Asn Pro Cys Ile
260 265 270
Leu Pro Gly Phe Asn Gly Thr Phe Thr Tyr Ser Gly Val Glu Tyr Lys
275 280 285
Ala Phe Ser Pro Ser Ser Gly Ser Asn Phe Asp Asp Cys Lys Glu Ile
290 295 300

Ile Leu Lys Val Leu Lys Val Asn Asp Pro Cys Pro Tyr Pro Ser Cys
305 310 315 320
Thr Phe Gly Gly Ile Trp Asn Gly Gly Gly Ser Gly Gln Lys Lys
325 330 335
Leu Phe Val Thr Ser Ala Phe Ala Tyr Leu Ala Glu Asp Val Gly Met
340 345 350
Val Glu Pro Asn Lys Pro Asn Ser Ile Leu His Pro Val Asp Phe Glu
355 360 365
Ile Glu Ala Lys Arg Ala Cys Ala Leu Asn Phe Glu Asp Val Lys Ser
370 375 380
Thr Tyr Pro Arg Leu Thr Asp Ala Lys Arg Pro Tyr Val Cys Met Asp
385 390 395 400
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 root lectin

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Arg Asn Thr Ala Lys Asn Ala Pro Lys Val Pro Glu Gly Glu Asp Pro			
225	230	235	240
tac ata aag aag ctt gta ctc cag gga aag aaa tat gac ctt tat gtt		768	
Tyr Ile Lys Lys Leu Val Leu Gln Gly Lys Tyr Asp Leu Tyr Val			
245	250	255	
cac agt tac ttg cgc tat gga aga gaa gca ttt cgt gca gag att ttc		816	
His Ser Tyr Leu Arg Tyr Gly Arg Glu Ala Phe Arg Ala Glu Ile Phe			
260	265	270	
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Lys Val Ala Gly Gly Ser Ala Asn Pro Cys Ile Leu Ala Gly Phe Asp			
275	280	285	
ggg gca tat aca tat tcc gga gca gag tat aag gtc tcg gcc cca gct		912	
Gly Ala Tyr Thr Tyr Ser Gly Ala Glu Tyr Lys Val Ser Ala Pro Ala			
290	295	300	
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Ser Gly Ser Asn Leu Asn Gln Cys Arg Lys Ile Ala Leu Lys Ala Leu			
305	310	315	320
aaa gtg aat gca cct tgt ccc tat cag aat tgc act ttt ggt ggg ata		1008	
Lys Val Asn Ala Pro Cys Pro Tyr Gln Asn Cys Thr Phe Gly Gly Ile			
325	330	335	
tgg aat ggt gga ggt gga agt ggt caa aaa aat ctt ttc ctt act tca		1056	
Trp Asn Gly Gly Ser Gly Gln Lys Asn Leu Phe Leu Thr Ser			
340	345	350	
tct ttc tat tac ctc tct gaa gat gtt ggg atc ttt gtg aat aaa ccc		1104	
Ser Phe Tyr Tyr Leu Ser Glu Asp Val Gly Ile Phe Val Asn Lys Pro			
355	360	365	
aat gcc aaa att cgt cca gtt gat ttg aag act gca gct aaa cta gct		1152	
Asn Ala Lys Ile Arg Pro Val Asp Leu Lys Thr Ala Ala Lys Leu Ala			
370	375	380	
tgt aaa aca aat ctt gag gat gca aaa tcc aaa tac cca gat ctt tat		1200	
Cys Lys Thr Asn Leu Glu Asp Ala Lys Ser Lys Tyr Pro Asp Leu Tyr			
385	390	395	400
gag aaa gac agt gtt gaa tat gtg tgc ttg gat ctt gtc tac gtg tac		1248	
Glu Lys Asp Ser Val Glu Tyr Val Cys Leu Asp Leu Val Tyr Val Tyr			
405	410	415	
aca ttg ctt gtt gat gga ttt ggt ctt gat cca ttt caa gag gtt aca		1296	
Thr Leu Leu Val Asp Gly Phe Gly Leu Asp Pro Phe Gln Glu Val Thr			
420	425	430	
gtg gcg aat gaa att gaa tat cag gat gct ctt gtg gaa gcc gca tgg		1344	
Val Ala Asn Glu Ile Glu Tyr Gln Asp Ala Leu Val Glu Ala Ala Trp			
435	440	445	

cct cta ggc act gcc ata gaa gca ata tca tca ttg cct aaa ttt gag 1392
 Pro Leu Gly Thr Ala Ile Glu Ala Ile Ser Ser Leu Pro Lys Phe Glu
 450 455 460

 aga tta atg tat ttt att taa act act agt acc tgc tta agc ctg gat 1440
 Arg Leu Met Tyr Phe Ile Thr Thr Ser Thr Cys Leu Ser Leu Asp
 465 470 475 480

 tac ctg aag aaa taa aat gaa ata aaa gcc gca tct ttc ttc ctt gct t 1489
 Tyr Leu Lys Lys Asn Glu Ile Lys Ala Ala Ser Phe Phe Leu Ala
 485 490 495

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 <400> 9
 Lys Cys Ser Ser Leu Cys Ser
 1 5

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 root lectin

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 Val Phe Met Leu Met Pro Ala Ile Ser Ser Ser Gln Tyr Leu Gly Asn
 20 25 30
 Asn Ile Leu Met Asn Arg Lys Ile Leu Leu Pro Lys Asn Gln Glu Pro
 35 40 45
 Val Thr Ser Tyr Ala Val Ile Phe Asp Ala Gly Ser Thr Gly Ser Arg
 50 55 60
 Val His Val Tyr Asn Phe Asp Gln Asn Leu Asp Leu Leu Pro Val Glu
 65 70 75 80
 Asn Glu Leu Glu Phe Tyr Asp Ser Val Lys Pro Gly Leu Ser Ser Tyr
 85 90 95
 Ala Ala Asn Pro Glu Glu Ala Ala Glu Ser Leu Ile Pro Leu Leu Lys
 100 105 110
 Glu Ala Glu Asn Val Val Pro Val Ser Gln Gln Pro Asn Thr Pro Val
 115 120 125
 Lys Leu Gly Ala Thr Ala Gly Leu Arg Leu Leu Glu Gly Asn Ala Ala
 130 135 140
 Glu Asn Ile Leu Gln Ala Val Arg Asp Met Leu Ser Asn Arg Ser Ala
 145 150 155 160
 Leu Asn Val Gln Ser Asp Ala Val Ser Ile Leu Asp Gly Thr Gln Glu
 165 170 175
 Gly Ser Tyr Leu Trp Val Thr Ile Asn Tyr Leu Leu Gly Lys Leu Gly
 180 185 190
 Lys Arg Phe Thr Lys Thr Val Gly Val Val Asp Leu Gly Gly Gly Ser
 195 200 205
 Val Gln Met Thr Tyr Ala Val Ser Arg Asn Thr Ala Lys Asn Ala Pro
 210 215 220

Lys Val Pro Glu Gly Glu Asp Pro Tyr Ile Lys Lys Leu Val Leu Gln
 225 230 235 240
 Gly Lys Lys Tyr Asp Leu Tyr Val His Ser Tyr Leu Arg Tyr Gly Arg
 245 250 255
 Glu Ala Phe Arg Ala Glu Ile Phe Lys Val Ala Gly Gly Ser Ala Asn
 260 265 270
 Pro Cys Ile Leu Ala Gly Phe Asp Gly Ala Tyr Thr Tyr Ser Gly Ala
 275 280 285
 Glu Tyr Lys Val Ser Ala Pro Ala Ser Gly Ser Asn Leu Asn Gln Cys
 290 295 300
 Arg Lys Ile Ala Leu Lys Ala Leu Lys Val Asn Ala Pro Cys Pro Tyr
 305 310 315 320
 Gln Asn Cys Thr Phe Gly Gly Ile Trp Asn Gly Gly Gly Ser Gly
 325 330 335
 Gln Lys Asn Leu Phe Leu Thr Ser Ser Phe Tyr Tyr Leu Ser Glu Asp
 340 345 350
 Val Gly Ile Phe Val Asn Lys Pro Asn Ala Lys Ile Arg Pro Val Asp
 355 360 365
 Leu Lys Thr Ala Ala Lys Leu Ala Cys Lys Thr Asn Leu Glu Asp Ala
 370 375 380
 Lys Ser Lys Tyr Pro Asp Leu Tyr Glu Lys Asp Ser Val Glu Tyr Val
 385 390 395 400
 Cys Leu Asp Leu Val Tyr Val Tyr Thr Leu Leu Val Asp Gly Phe Gly
 405 410 415
 Leu Asp Pro Phe Gln Glu Val Thr Val Ala Asn Glu Ile Glu Tyr Gln
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 Asp Ala Leu Val Glu Ala Ala Trp Pro Leu Gly Thr Ala Ile Glu Ala
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 Ile Ser Ser Leu Pro Lys Phe Glu Arg Leu Met Tyr Phe Ile
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Thr Thr Ser Thr Cys Leu Ser Leu Asp Tyr Leu Lys Lys
 1 5 10

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<213> Lotus japonicus

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 PCR primer

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20

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PCR primer

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17